HOUSEHOLD AND NATIONAL FOOD SECURITY IN SOUTHERN AFRICA

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FOREWORD

In 1985 the University of Zimbabwe and Michigan State University initiated a Food Security Research Network for Southern Africa. The objectives of the network are to conduct research that informs policymakers about food security issues and to help strengthen the regional capacity for food policy analyis. The underlying premise of the network is that building excellence in research capacity for national policy analysis comes through experience. In practice, this requires a long-term commitment to analytical capacity building, consistency in funding, and constant interaction between researchers and policymakers.

The network has sponsored four annual conferences for network researchers, policymakers, SADCC officials, and representative of international and donor agencies. The aim of the conference is to share research findings, identify new research themes, and provide an opportunity for policy dialogue between regional researchers, policymakers, and government officials.

The 1988 conference brought together 110 participants who deliberated on 28 papers. In the Official Opening, Vice-Chancellor W.J. Kamba of the Univesity of Zimbbawe highlighted the importance of including health related-issues as a component of food security; and Zimbabwe's Senior Minister of Finance, Economic Planning, and Development B.T.G. Chidzero outlined policy reform priorities for Southern Africa. Subsequent sessions focused on *SADCC's Food Security Programme, the Impact of Market Reform on Food Security, Food Security Policy Options, New Technology to Improve Food Security, Family Food Security Options in Low-Rainfall Areas, Expanding Agricultural Trade in the SADCC Region, Nutrition and Food Security, the Contribution of Small-Scale Rural Enterprises to Employment Generation and Food Security, and the Impact of Irrigation on Food Security.*

A highlight of the 1988 conference was the participation of five nutritionists from Zambia, Zimbabwe, Sweden, and the United States. The presence of the nutritionists stimulated formal and informal discussions on the food access side of the food security equation and drew attention to the need to initiate more research in this area.

A second highlight of the 1988 conference was the attention given to reducing barriers to expanded intraregional trade in the SADCC region. Results presented suggest that there appear to be substantial price and nonprice barriers to expanded trade. Nevertheless, there exist significant opportunities for expanding intraregional trade that can be realized through appropriate government initiatives.

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IMPACT OF IRRIGATION ON FOOD SECURITY

IRRIGATION AND FOOD SECURITY: CURRENT STATUS AND RESEARCH PRIORITIES IN TANZANIA

Sylvester Sisila[1]

INTRODUCTION

Agriculture forms the backbone of the Tanzanian economy. Approximately 85% of the population live in the rural sector. The sector contributes about 50% of the Gross Domestic Product (GDP) and approximately 80% of the total export earnings (Msambichaka *et al.*, 1983; Tanzania, 1987). The performance of the sector will therefore determine the capacity to import capital and other goods required for investment and consumption.

The objectives of irrigation policy are to increase national income; modernise agriculture; stabilize farmers' incomes; expand agricultural output; stabilize food supplies; and solve specific local problems (Tanzania, 1983; FAO, 1987).

Irrigation is practiced in all stages of production technology, but in varying degrees of importance and sophistication. Traditional irrigation is common in some areas of the country such as Kilimanjaro, Kilombero, Arusha, Mbeya, and the Lake Victoria zone. These small-scale schemes were based on gravitation and traditionally-constructed control works. Water management and control were exercised through local and village governments. Crops grown under traditional irrigation include paddy, maize, bananas, coffee, and some legumes and vegetables.

Modern large-scale irrigation started around the 1930's (FAO, 1987) with the introduction of estate agriculture, particularly for the production of sugarcane, coffee, tea, cotton, and paddy. Today most of the sugarcane is produced on estates under irrigation.

The development of irrigation in Tanzania is justified by the low rainfall, which is unreliably distributed in large areas of the country, with occasional total failure in the whole country. Only about one-half of the country receives 750 mm of annual rainfall with an 80% probability. Under East African conditions, 750 mm per year is the threshold value below which cultivation is marginal (Tanzania, 1976).

Three-quarters of Tanzania receives less than 1,000 mm of rainfall per year, while a greater part of the country has an annual potential evapotranspiration of over 2,000 mm from open water. Such low rainfall, its unreliable distribution, and occasional total failure--combined with high evapotranspiration--make irrigation a necessity for the development of agriculture in Tanzania. Also, irrigation increases the yields of agricultural crops (Table 1).

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[1]Food and Agriculture Organization, Dar es Salaam.

Table 1. Effects of irrigation on crop yields in Tanzania, 1981.

Crop	Yield (kg/ha)	
	Irrigated	Rainfed
Paddy	4-5,000	1,200
Maize	3,300	1,600
Cotton	1,800	500

Source: Agrar-und Hydrotechnik (1981).

CURRENT STATUS OF IRRIGATION DEVELOPMENT

Potential for irrigation development

Tanzania is a large and diverse country with an area of 939,700 km^2. While approximately 20-30% (Kaplan, 1978; Msambichaka, *et al.*, 1983) of the area is considered arable, only about one-fifth of the arable area is presently under cultivation. The cultivated area amounted to 5,561,370 ha in the 1985-86 planting season (Tanzania, 1987).

In contrast, the irrigated area is only about 3% of the area under cultivation (FAO, 1987; Msambichaka, *et al.*, 1983. The Ministry of Agriculture and Livestock Development (MALD) estimates the area under irrigation at 144,000 ha (Tanzania, 1987).

The major potential for irrigation is based on the existence of numerous basins and valleys formed by various rivers and lakes (Table 2). In addition to the major basins, there are numerous smaller basins, mostly of internal drainage systems, offering some potential for small-scale irrigation developments.

The Rufiji Basin harbours the greatest irrigation potential in the country. It is also probably the most studied of all the basins, not least because this basin also has the largest hydro-power potential. A number of operational and planned irrigation schemes are found in the Rufiji Basin.

The Rufiji Basin comprises the river systems of Great Ruaha, Kilombero, and Luwegu-Luhombero, which join to form the Rufiji River *per se* before entering the Indian Ocean. Studies by FAO (1961) identified the following irrigation potential in the three main subbasins of the Rufiji river systems: Great Ruaha (Usanga Plains), 240,000 ha; Kilombero Valley, 300,000 ha; and Lower Rufiji Valley, 100,000 ha. More recent investigations have indicated that up to 65,000 ha could be economically developed for irrigation in the Lower Rufiji Valley (Agar-und Hydrotechnik, 1981).

Table 2. Major basins with irrigation potential, Tanzania.

Name	Potentially irrigable area (ha)
Rufiji River Basin	640,000
Wami River Basin	32,000
Lake Victoria Basin	29,000
Kagera River Basin	20,000
Ruvu River Basin	20,000
Ngono River Basin	16,000
Luiche River Basin	10,000
Pangani River Basin	10,000
Others	88,000
Total	865,000

Source: FAO (1980) and Msambichaka *et al.* (1983)

Current and planned irrigation schemes

There are a number of large-scale and smallholder irrigation schemes currently operational in the country. More schemes are either under implementation or planned for execution in the near future. The most important of these schemes and their status are presented in Table 3.

This table also shows that irrigation in Tanzania is applied on a large scale on a very few crops, mainly rice, sugarcane, tea, and maize. Supplementary irrigation, mainly by sprinklers, is also applied on some coffee plantations.

Constraints on irrigation development

A major constraint on irrigation development is the lack of financial resources for implementing projects. The general poor performance of the national economy, and particularly the lack of foreign currency, has had a profoundly adverse impact on the ability to undertake irrigation projects. Generally, foreign exchange constitutes over one-half of the total development costs of irrigation projects. Development costs range between US$5-10,000 (FAO, 1987a). The absence of a government irrigation policy has led to irrigation projects being introduced on an *ad hoc* basis. Despite these problems, irrigation has an important role to play in the economy.

INSTITUTIONAL ARRANGEMENTS

Historical Perspective

The present Irrigation Division in the Ministry of Agriculture and Livestock Development is an outgrowth of numerous changes in the administration of water

Table 3. Major irrigation schemes and their status, Tanzania.

Staus/ Scheme	Crop	Area (ha)	Irrigation method
Operational			
Mbarali[a]	Rice	3,200	Surface
Madibira[a]	Rice	600	Surface
Dakawa	Rice	2,000	Surface
Ruvu	Rice	730	Surface
Kahe	Maize/lucerne	1,510	Surface
TPC	Sugarcane	6,480	Surface/sprinkler
Kilombero[a]	Sugarcane	4,480	Sprinkler
Mtibwa	Sugarcane	1,750	Sprinkler
Lower Moshi	Rice	2,300	Surface
Mufindi Estates	Tea	2,000	Sprinkler
Under construction			
Usangu Village Project[a]	Rice	4,200	Surface
Bahi/Kintiku[b]	Rice	4,000	Surface
Tanga (rehabilitation)	Rice	4,120	Surface
Mto wa Mbu	Rice/maize	2,500	Surface
Iringa (rehabilitation)	Rice	1,300	Surface
Kitivo Village Project	Rice	495	Surface
Mwamapule Village Project	Rice	540	Surface
Kilimanjaro[c]	Rice/maize	4,000	Surface
Mngeta[a]	Rice/maize	5,000	Surface
Planned design			
Kapunga Rice Project	Rice	5,700	Surface
Madibira[a]	Rice/maize	8,000	Surface
Ikwiriri	Rice/maize	1,000	Surface
Feasibility study			
Morogoro Village Irrigation	Rice	2,000	Surface
Planned for 1988			
Kimani Village Project	Rice	2,000	Surface

[a]Located in the Rufiji Basin; [b]400 ha completed; [c]Rehabilitation of traditional irrigation.
Source: FAO

resources development. Based on the recommendation of a Royal Commission to identify possible measures of improving living standards in East Africa, the Water Development Department of the Ministry of Agriculture was expanded into the Water Development and Irrigation Department in 1955, and later up-graded to the Water Department and Irrigation Division (WDID).

In 1964 WDID was transferred to the then Ministry of Lands, Settlement and Water Development. WDID had a tendency of concentration on large-scale irrigation developments while paying little attention to the development of smallholder schemes, including rehabilitation of traditional irrigation systems. As a result, in 1968, the Ministry of Agriculture initiated its own section to cater for the traditional small-scale irrigation. In 1969, WDID was transferred to the Ministry of Agriculture, only to be moved again, this time to a new Ministry of Water Development and Power. This transfer was rather unfortunate as far as irrigation

was concerned, since the parent ministry was more interested in rural water supply and energy than in irrigation.

In 1973, all functions relating to irrigation development were transferred to the Ministry of Agriculture and the present Irrigation Division of the Ministry was established in 1975. It is today under the new Ministry of Agriculture and Livestock Development (MALD).

Current organization of irrigation

The Director of the Irrigation Division reports directly to the Principal Secretary of MALD. In addition to the Irrigation Division, there are other institutions, mostly parastatals, with some responsibility for irrigation development. The most important are the Rufiji Basin Development Authority (RUBADA), the National Agricultural and Food Corporation (NAFCO), and the Sugar Development Corporation (SUDECO). RUBADA is responsible for the management of the Rufiji Basin. It is also undertaking irrigation development in the basin with assistance from the Governments of the Islamic Republic of Iran and the Democratic People's Republic of Korea. NAFCO is responsible for the production of food grains and owns the large-scale rice schemes (Mbarali, Dakawa, and Ruvu). SUDECO is the holding parastatal of the sugar estates.

FUTURE RESEARCH NEEDS

Current research is being carried out through the Tanzania Agricultural Research Organization (TARO) and the Directorate of Research and Training in the Ministry of Agriculture and Livestock Development. Under TARO are a number of research institutes with crop-specific research programmes. Furthermore, research is undertaken by other institutions like the Sokoine University of Agriculture and the Uyole Agricultural Centre.

Policy formulation

The absence of an irrigation policy has been partly blamed for the slow pace of irrigation development and for some of the failures. Research is required to establish realistic policy approaches and targets, taking into account available resources and potentials and their sustained use. The on-going FAO/UNDP Project on Institutional Support seeks to formulate a medium- and long-term plan for irrigation development in Tanzania.

Institutional arrangements

The history of institutional arrangements serves to illustrate the need to establish a rational and effective set-up for irrigation development in the country. Some research is necessary to establish the optimum size of institutions, organizational and functional relationships, manpower requirements, and development training needs.

Economics of irrigation

Hardly any investigations have been carried out on the economics of irrigation in Tanzania. There is an urgent need to undertake research on existing and on-going projects, in order to identify ways of increasing the profitability of irrigation schemes.

Surface and sprinkler irrigation in Tanzania is limited to areas of abundant water. However, there are some arid and semi-arid areas in the country with good soils for crop production and sometimes with adequate underground water resource. In such areas, water-saving irrigation methods could play a great role in increasing crop production. Research is required to establish the quantity and quality of available water resources and determine appropriate irrigation methods. It is also important to establish, when implementing new schemes or rehabilitating existing ones, particularly smallholder schemes, whether full-levelling of the farm areas for total water control is of any significant advantage over partial-levelling. The FAO/UNDP irrigation project in Usanga intends to test various development alternatives in the project area, including total development with full-levelling and canal improvement compared to partial levelling. Similar research would be required in other areas with different physiographic and ecological conditions to test the economics of various development alternatives.

Regional cooperation

Lastly, there is a need for research on the potential of implementing joint irrigation projects on a regional basis. This collaboration need not necessarily be limited to shared land and water resources. The Rufiji Basin, for example, has irrigation potential which, due to limited resources, Tanzania alone will not be able to exploit fully in the foreseeable future. If, however, several countries could cooperate on a regional basis, this potential could be tapped for the benefit of all. Some research is therefore required to establish the possibilities and modalities of such collaboration.

CONCLUSION

Tanzania has abundant potential for irrigation development. If adequately exploited, this potential could make an important contribution, not only to current crop production, but also to safeguarding this production against vagaries of the weather. Current government efforts to develop irrigation are welcome and deserve the necessary support. Lessons learned from past mistakes and failures should thereby serve as a useful tool in future developments.

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